

Next Generation Tactical Situation Assessment Technologies (TSAT)

“Iconic Chat Data Glove”

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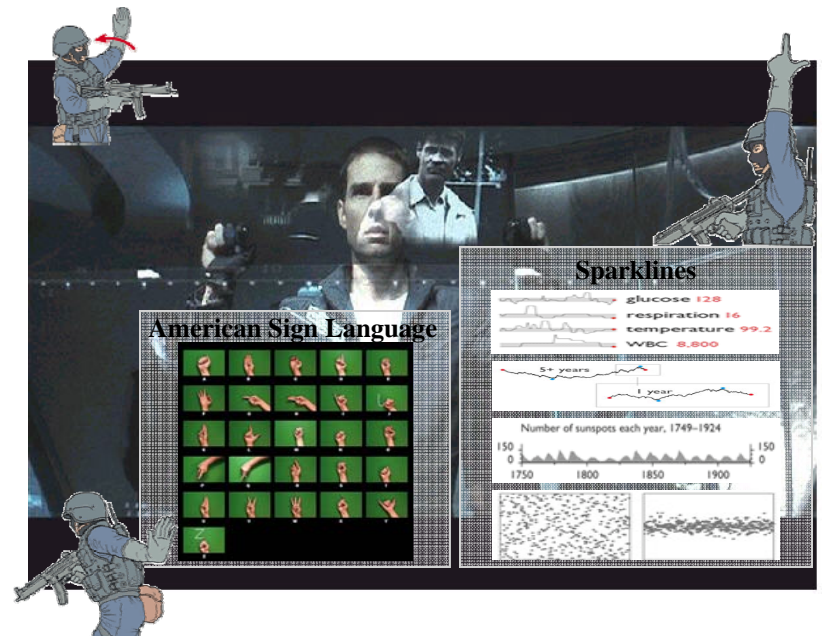
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Agenda



- Objective: Chat in Situation Assessment (SA):
 - Today
 - Tomorrow's Vision
- Technical Approach w/emphasis on FY07 Goal
 - **Linguistic Research and Analysis** focusing on predicting situation assessment *content*
 - **Visual/Icon-based Language** of Situation Assessment
 - **Technology of Inscription** (Keyboard-Independent Data Entry Technology for hostile/extreme environments)



Today's Chatroom as Context Sharing "Technology"

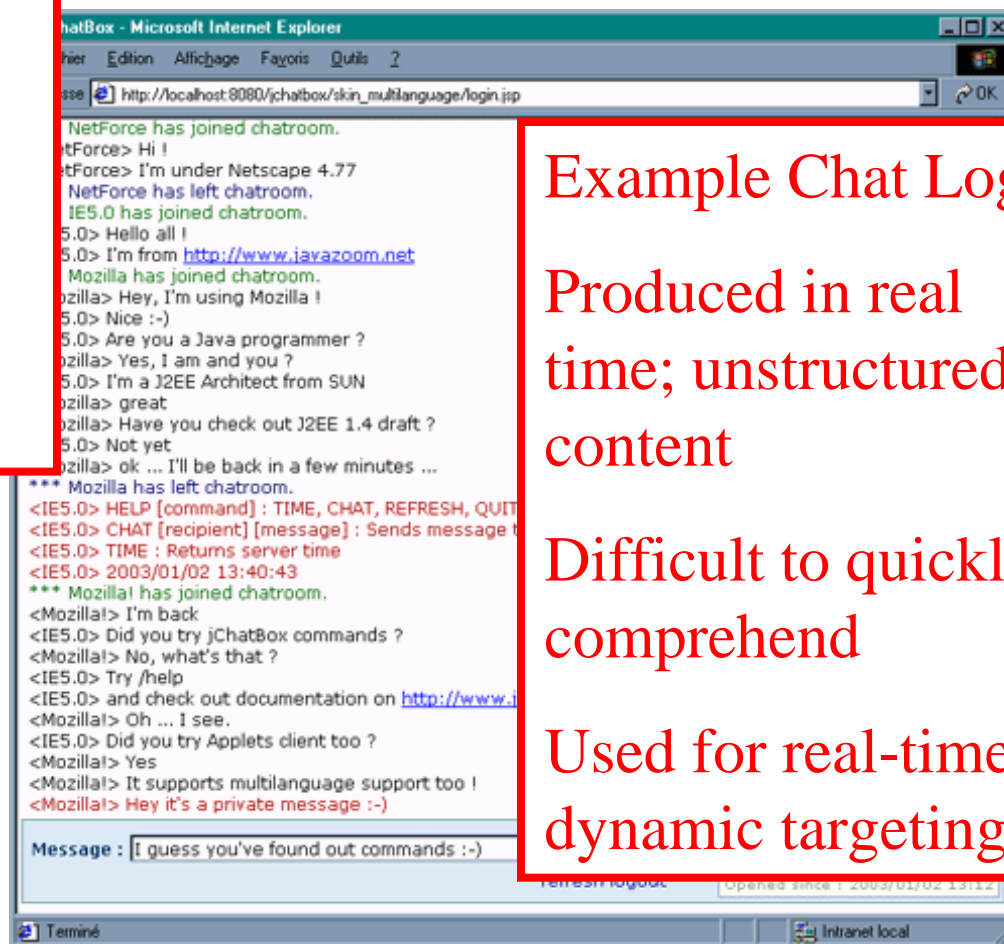


- *Chat is the Primary* and often *singular* means of tactical communication for situation updates on intermittent/discontinuous networks, superseding radio communications
- **Strikegroup (ship) CONOPS:** Establish 500-800 chatrooms, 2-4000 users in each "channel," based on functional roles; establish at beginning of mission, continuing for months to years
- **Joint CONOPS:** Establish hundreds of chatrooms in theater of operations with joint service participation, based on mission objectives; allows joint access to service specific chatrooms to maintain non-intrusive situation awareness of service-specific activities
- **Chat Functions:**
 - Supports real-time targeting;
 - Supports edge users (on low/intermittent b/w)
 - Immediate COP context updates
 - General information sharing updates on regular basis (across months) to establish ops-tempo/battle rhythm management
 - Supports Cross-Domain operations

What it looks like today: 1980 → 2006

R xxxxxxZ OCCASIONALLY
FM COMCARSPACOM
TO USJFCOM
USPACOM
ALLIED COMMANDERS
AC2C4ISR LANTCOM
DISA WASHINGTON
SPAWAR SYSTEMS CENTER
NAVAL POSTGRADUATE SCHOOL
USS ENTERPRISE
USS ANZIO
INFO COMMANDER NAVAL NETWORK WARFARE COMMAND
BT
MSGID/GENADMIN/COMCARSTKGRU TWELVE/-/OCT//
SUBJ/WELL DONE//
RMKS/1. I WISH TO SEND NOTE OF PERSONAL THANKS FOR YOUR
SUPPORT OF OUR JOINT/COALITION OPEN STANDARDS TACTICAL
CHAT DEMONSTRATION ON 19 OCT 05. YOUR ORGANIZATIONS
PROVIDED EXCEPTIONAL SUPPORT IN TERMS OF ENGINEERING,
EQUIPMENT TO HOST THE TEST, AND PERSONNEL TO PARTICIPATE
AND PROVIDE FEEDBACK. THE TEST WENT EXCEEDINGLY WELL
AND WOULD NOT HAVE BEEN POSSIBLE WITHOUT YOUR ASSISTANCE
AND DEDICATION. SPECIAL APPRECIATION GOES TO:

DMS (and Email):
Produced Time-late
Difficult to read
Not used for real-time
ops, but as formality



```

NetForce has joined chatroom.
NetForce> Hi !
NetForce> I'm under Netscape 4.77
NetForce has left chatroom.
IE5.0 has joined chatroom.
5.0> Hello all !
5.0> I'm from http://www.javazoom.net
Mozilla has joined chatroom.
Mozilla> Hey, I'm using Mozilla !
5.0> Nice :-))
5.0> Are you a Java programmer ?
Mozilla> Yes, I am and you ?
5.0> I'm a J2EE Architect from SUN
Mozilla> great
Mozilla> Have you check out J2EE 1.4 draft ?
5.0> Not yet
Mozilla> ok ... I'll be back in a few minutes ...
*** Mozilla has left chatroom.
<IE5.0> HELP [command] : TIME, CHAT, REFRESH, QUIT
<IE5.0> CHAT [recipient] [message] : Sends message to
<IE5.0> TIME : Returns server time
<IE5.0> 2003/01/02 13:40:43
*** Mozilla has joined chatroom.
<Mozilla> I'm back
<IE5.0> Did you try jChatBox commands ?
<Mozilla> No, what's that ?
<IE5.0> Try /help
<IE5.0> and check out documentation on http://www.j
<Mozilla> Oh ... I see.
<IE5.0> Did you try Applets client too ?
<Mozilla> Yes
<Mozilla> It supports multilanguage support too !
<Mozilla> Hey it's a private message :-))
Message : [ I guess you've found out commands :-))

```

Example Chat Log:
Produced in real
time; unstructured
content
Difficult to quickly
comprehend
Used for real-time
dynamic targeting



S&T Challenge



- **Objective:** Enhance *rapid* situation assessment updates among teams of warfighters in a hostile environment through language improvement and novel, wearable computing devices.
- Today's Chat, should, in 10 years:
 - Must not be solely text-driven (too slow; too ambiguous, very unstructured) → combined, efficient icon + text
 - I-18-n=Internationalization capable
 - Must be able to accommodate edge (*tactical*) users
 - Capable at very low b/w, high jitter environment
 - Chemical-Biological Warfighters in MOPP gear
 - Special Operations in Hostile Settings: oil spills, fire, tsunamis, oxygen-deprived environments
 - Very-Edge Users: minesweepers, submarines, and astronauts
 - Must be able to integrate with geographic land-based terrain maps and COPs, *AND* non-geographic *computer-based* “terrain” (global network ops-network topology)

Technical Approach

- **Linguistic Research & Analysis**
 - Improve the ability to derive *the content* of **current chat** messages, by defining candidate linguistic “themes” of warfighter language, for transition to an augmented icon-based language, to improve efficiency of knowledge sharing
- **Visual/Icon-based Language of Situation Assessment**
 - Develop a **icon/symbol-based language** to augment text, used to more quickly communicate complex relationships and *evolution* of relationships of objects of interest in geographic and non-geographic environments; a true combat “*leet speak*”
- **Technology of Inscription**
 - Prototype a revolutionary *keyboard-independent* **technology of inscription** for this new language, for use in a Net-Centric Warfare environment



Linguistic Research & Analysis



- Fleet usage of chat is widespread, but current tools and management of chat databases are vastly inadequate for information retrieval
 - ASW
 - Air Force
 - Battlewatch centers
- Accurate portrayal of the military chat domain is essential for any future improvements to chat clients, GUIs, or methods of use.
- Identifying topic trends present in all military chat domains can help to define the problem space
- Statistical analysis of chat--its structure, topical organization, and user trends--must first be applied



Linguistic Research & Analysis



Computer Mediated Discourse (CMD)

- A field of study that focuses primarily on unstructured textual analysis
- Modes of communication include chatrooms, instant messaging, emails, wikis, and blogs

Text Data Mining

- A data mining application that reveals new information from text collections
- Computational Linguistics employs text data mining to statistically analyze corpora in order to discover useful patterns or trends



Linguistic Research & Analysis






Methodology

- A corpus, or collection of texts, must first be preprocessed to remove information-poor terms
 - Determiners
 - Conjunctions
 - Modifiers
 - Tokenization
 - Lemmatization
- Once a corpus has been reduced to its most information-heavy state, statistical analyses can be applied
 - Word sense disambiguation
 - Text categorization
 - Clustering

Visual & Icon-based Language



Chat is currently primarily textual, however...

- Symbolic and visual information is prevalent
- Visual information is often embedded directly within chat
 - emoticons: :)
 - acronyms: **lol** - **5,689 documented acronyms** in use by DoD (Joint Publication 1-02)
 - wordplay (l337 speak): **t8k m3 700 j00r 13373r**
 - color: **speaker identification**, **emphasis**, differentiation
 - [hyperlinks](#) / URIs
 - embedded icons & images: 
 - file & object attachments:  
- These are natural and inevitable augmentations of textual-based communication
- Convey information in a **simple, compact, and efficient** manner
- Neither chat nor its visual content is disciplined:
 - loose associations
 - language misuse
 - ambiguous acronyms
 - no formal chat iconography or integration with existing standards for symbols (MIL STD 2525b, NATO Military Symbols) or acronyms (Joint Publication 1-02)
 - difficult to use entry and retrieval mechanisms

These problems result in a loss of shared context, information loss, and communication errors

Visual & Icon-based Language



We want chat users to utilize visual language and visual representations of knowledge.

Why?

- Increase information carrying capacity
- Enhance expressiveness of the chat medium
- Eliminate ambiguity when using a formal iconography and shared context
- Embrace the concept of **shared context**
- Enable a radical transformation of the communications medium
- Provide a natural bridge between gesture and text communication

“...gesture supplies a visual, iconic component that can provide extra information or circumvent prolonged explanation....Moreover, people naturally resort to manual gestures when trying to communicate with people who speak a different language.”

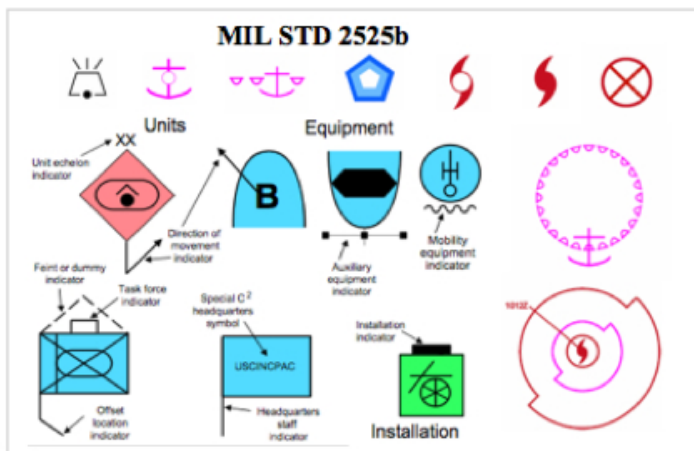


Dr. Michael C. Corballis, 1999
"The Gestural Origins of Language"

How can we best **augment**, **disambiguate**, and **improve** textual content using visual representations of **language**, **objects**, and **information**?

Visual & Icon-based Language

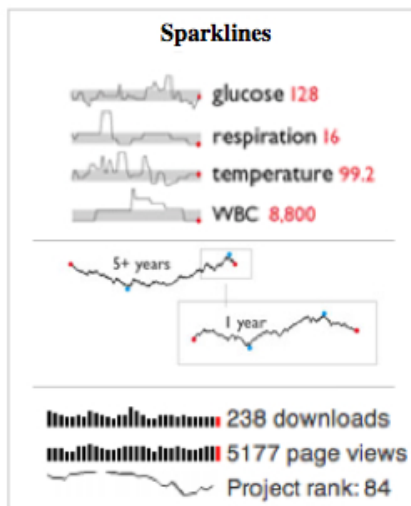
MIL STD 2525b



Units: Unit echelon indicator, Direction of movement indicator, Unit location indicator, Faint or dummy indicator, Task force indicator, Special C² headquarters symbol, Headquarters staff indicator

Equipment: Auxiliary equipment indicator, Mobility equipment indicator, Installation indicator

Sparklines

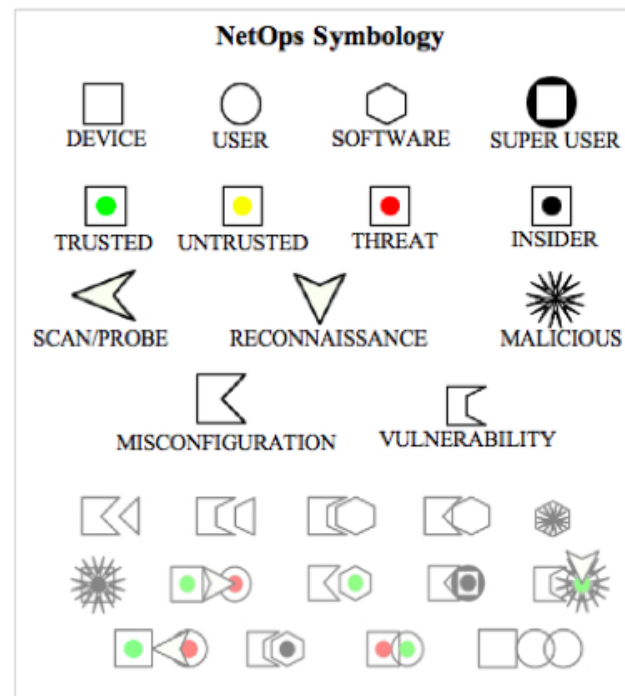


glucose 128
respiration 16
temperature 99.2
WBC 8,800

5+ years
1 year

238 downloads
5177 page views
Project rank: 84

NetOps Symbology



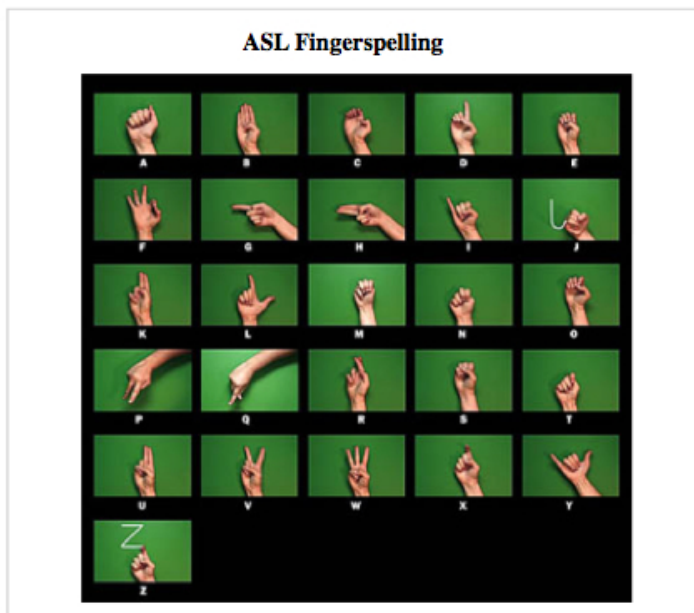
DEVICE USER SOFTWARE SUPER USER

TRUSTED UNTRUSTED THREAT INSIDER

SCAN/PROBE RECONNAISSANCE MALICIOUS

MISCONFIGURATION VULNERABILITY

ASL Fingerspelling



A B C D E
F G H I J
K L M N O
P Q R S T
U V W X Y
Z

Emergency Response



Hazmat



EXPLOSIVES 1.1
POISON 6
FLAMMABLE 3
CORROSIVE 8

Blissymbolics



BOOK MEDICAL KNOWLEDGE PLANT MONEY HOUSE

library greenhouse bank hospital, clinic
school



Technology of Inscription



Development of a keyboard-independent language-entry device

- Initial development of a wireless glove capable of digitizing movement and position of user's fingers, hands and arms
- Glove can operate as a keyboard/input replacement where a standard keyboard would not be possible (hostile environment/chemical fires/biological threat) or is inconvenient (in space/underwater)
- Capable of recognizing static and dynamic gestures

Technology of Inscription

Gestures in Hostile Environments

- Noisy environment: speech not viable or difficult to discern (>5 “talking;” chemical fires, liftoff; outerspace; underwater)
- Covert/silent environment: need to communicate without alerting enemy
- Precise communication: gestures can be an efficient means of communication, coupled with persistent storage

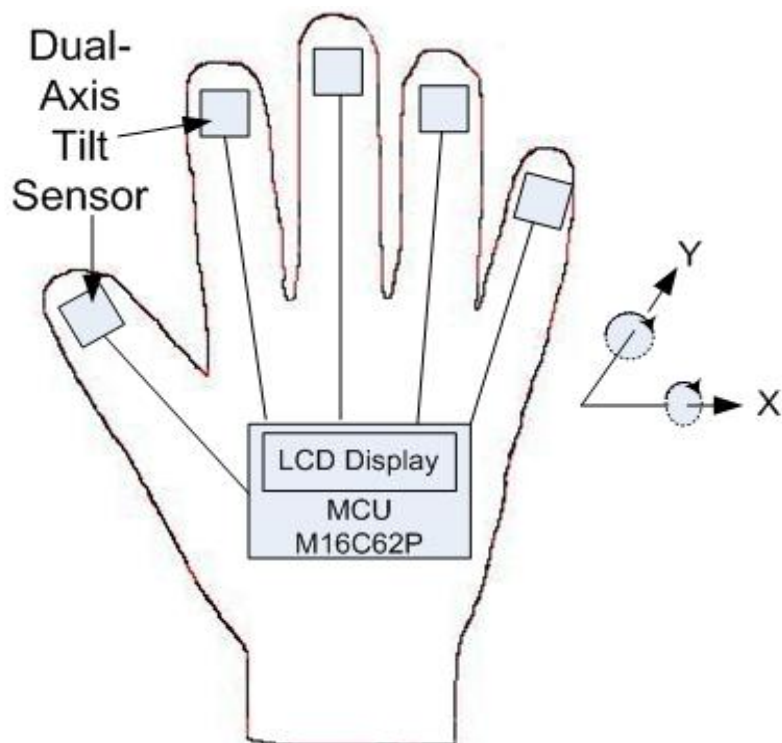


Static Gestures



Dynamic Gestures

Technology of Inscription Data Glove Prototype



Layout Sensors



A complete glove system



FY07 Goals



Linguistic Research and Analysis

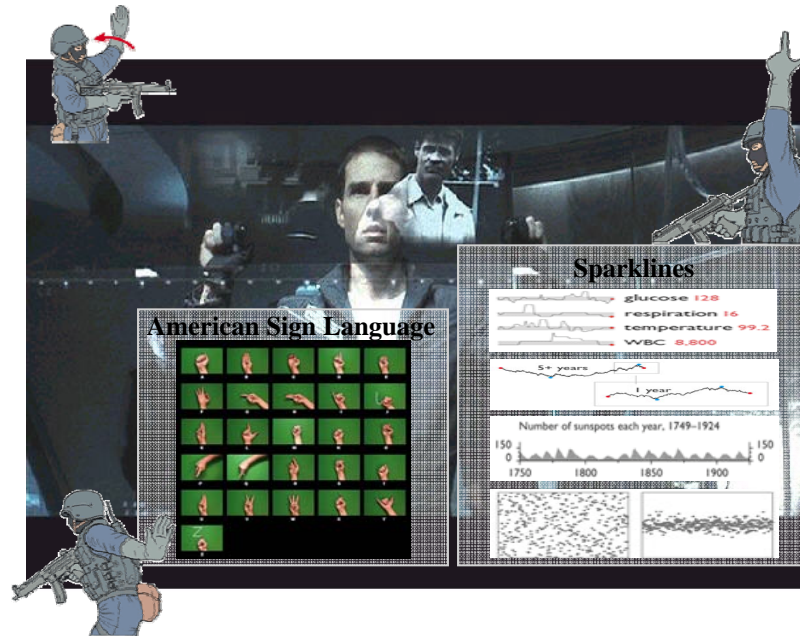
- Metrics identification and testing
- Statistical analysis of chatroom topical content, user trends/themes
- Initial prototype in place for chat user database or topic threading detection

Visual and Icon-Based Language

- Research state-of-the-art visual language techniques which can be applied to Situation Assessment chat communication
 - Icons & Acronyms: MIL STD 2525b, JP 2-01
 - Constructed languages: Blissymbolics, Phonetic Picture-writing
 - Domain specific languages: ChemBio, ASW, NASA, Special Forces, Global NetOps
- Identify innovative presentation mechanisms which can be used
- Application specific visual communication: Gesture, ASL
- Determine metrics for ease of use, efficiency, and ambiguity resolution. Does information capacity (knowledge) increase with less keystrokes?

Technology of Inscription

- Reconfigure sign language glove for wireless connectivity
- 1st Generation Programmable interface
- Work with G-speak/MIT/UCIrvine/UCSD/NASA on novel interface methods



Questions?



Linguistic Research & Analysis References



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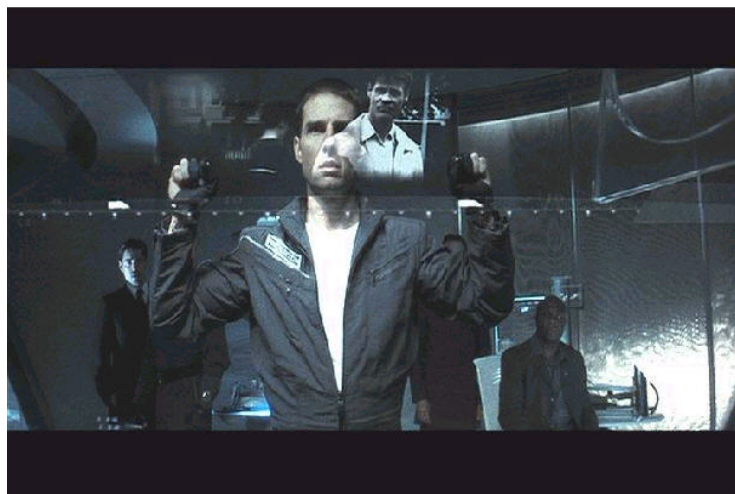


Visual & Icon-based Language References



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G-Speak Gestural Technology



g-speak is the first commercially oriented gesture recognition company, with solutions already in development in the defense and aerospace sectors. g-speak inventor and company founder John Underkoffler consulted on “Minority Report” to develop the gesture language used by characters to call up and sift through video material in that futuristic film.

www.g-speak.com (for CBS video) or contact Thomas Wiley at (323) 244-8366.

<http://www.g-speak.com/>